

ES&S Unity 3.2.0.0 DS200 and Ballot Box Voting System Test Plan

Performed for

Systest Labs

By



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1.0 Overview

This test plan describes the hardware evaluations performed in accordance with the Voluntary Voting System Guidelines (VVSG) 2005. While some sections are quoted in this test plan, please see the VVSG itself for full details.

1.1 Testing Process Overview

The following steps shall be followed for all submitted products:

- Systest and Percept Technology Labs shall inventory and document the receipt of all vendor materials.
- Testing, as defined in the test plan, will not proceed until formal authorization has been given. Deficiencies encountered during the Testing Phase will be documented and tracked.
- Upon project completion, the deliverable shall be a test report outlining in detail all of the testing performed per the test plan and a written recommendation of approval or rejection to Systest Labs.

2.0 Definitions

2.1 Failures

The following definitions apply to errors or failures (deficiencies) that occur during the testing:

1. Critical deficiency

- Unrecoverable data error that would affect the loss or corruption of voting data.
- Unrecoverable functional error that causes the system to be inoperable.
- Mechanical failure
- Safety issue

2. Non-critical deficiency

- Performance degradation
- Specification deviation
- Command completed, but failed to meet a specification

The nature of any deficiency encountered during the testing is described in detail sufficient to support the classification as critical or non-critical. The classification is based on consideration of the probable effect the deficiency will have on reliable, safe, accurate and efficient system operation during all phases of election use.

All critical deficiencies must be resolved before a recommendation of approval can be made for the system. An unresolved non-critical deficiency shall not necessarily be cause for a rejection recommendation. Deficiencies of this type may include failure to fully achieve the levels of performance specified in Volume I, Sections 3 and 4 of the Standards.

Note: The resolution of a deficiency may, in some cases, require re-executing already completed tests resulting in additional charges.

3.0 Product Assessment Phase

The following items shall be taken into consideration during the Assessment Phase to ensure that the product is ready for test and determine the specific tests that will be performed during the Testing Phase. Although the Assessment Phase, typically, is completed prior to the generation of the test plan it is included in this document since it is crucial to successful execution of the test plan.

3.1 Hardware Classification

Hardware shall be identified and classified in one of the following categories:

- Unmodified COTS (commercial off-the-shelf): Equipment that is commercially available, which can be independently purchased based on the vendor's system specification, with assembly performed by the jurisdiction. Vendors shall provide the manufacturers specifications and evidence that the equipment has been tested to the equivalent of the VVSG.
- Modified COTS: Commercially available (COTS) components that are assembled or packaged in a case or modified by the vendor.
- Non-COTS: The vendor manufactures the voting system.

Note: Non-COTS and modified COTS components are subject to all environmental testing. Unmodified COTS hardware is exempt provided the specifications and evidence of testing meets the requirements of the VVSG.

3.2 Documentation Review

The vendor shall provide hardware specifications and documentation, as part of the Technical Data Package (TDP), needed to assess, operate and maintain the voting system. These documents include, but are not limited to:

- All manuals and product specifications required for constructing, operating and maintaining the system;
- Set-up/operation instructions for all support equipment, including software and hardware.
- Previous qualification/test reports on COTS and Modified COTS equipment.
- Previous qualification/test reports from other testing organizations.
- Maintenance procedures.

The supplied documentation will be reviewed to ensure that it is adequate for operating the equipment and that testing operations can be performed.

3.3 Operational Status Check

When all tests, inspections, repairs, and adjustments have been completed, normal operation shall be verified by conducting an operational status check. During this process, all equipment shall be operated in a manner and environmental conditions that simulate election use to verify the functional status of the system. Prior to and following the conduct of each of the environmental hardware non-operating tests, a test shall be performed to determine that the operational state of the equipment is within acceptable performance limits.

The following procedures shall be followed to verify the equipment status:

Step 1: Arrange the system for normal operation.

Step 2: Turn on power, and allow the system to reach recommended operating temperature.

Step 3: Perform any servicing, and make any adjustments necessary, to achieve operational status.

Step 4: Operate the equipment in all modes, demonstrating all functions and features that would be used during election operations.

Step 5: Verify that all system functions have been correctly executed.

3.4 Testing Phase Entrance Criteria

The following are deliverables from the Assessment Phase and trigger entry into the Testing Phase:

- Test Plan agreed upon by all involved parties
- Estimated testing time and budget
- Fully operational system
- Key contacts identified for all involved parties (email, phone and fax numbers)

3.5 Test Plan Generation

The following checklist is the final step in the assessment phase of the product evaluation. Once this checklist is complete, the product will progress to the testing phase.

Applicable	Item	VVSG Reference	Comments
Assessment			
<input checked="" type="checkbox"/>	EUT inventory	N/A	See the PCA Traveler.
<input checked="" type="checkbox"/>	Hardware classification	N/A	No COTS equipment is involved in this test.
<input checked="" type="checkbox"/>	Documentation Review	N/A	Complete.
<input checked="" type="checkbox"/>	Operational Status Check	N/A	Complete.
Non-Operating Tests			
<input checked="" type="checkbox"/>	Maintainability Test	V2 4.7.2	
<input checked="" type="checkbox"/>	Safety Evaluation	V1 4.3.8	
<input checked="" type="checkbox"/>	Transit Drop	N/A	Florida Voting System Standards, Form DS-DE 101, Eff. 1-12-05
Non-Operating Environmental Tests			
<input checked="" type="checkbox"/>	Bench Handling Test	V2 4.6.2	
<input checked="" type="checkbox"/>	Vibration Test	V2 4.6.3	
<input checked="" type="checkbox"/>	Low Temperature Test	V2 4.6.4	
<input checked="" type="checkbox"/>	High Temperature Test	V2 4.6.5	
<input checked="" type="checkbox"/>	Humidity Test	V2 4.6.6	
Operating Environmental Tests			
<input checked="" type="checkbox"/>	Accessibility and Human Engineering Evaluation	V1 Appendix B, Mil Std 1472	
<input checked="" type="checkbox"/>	Temperature/Power Variation and Reliability	V2 4.7.1, V2 4.7.3	
<input checked="" type="checkbox"/>	Data Accuracy	V2 4.7.1.1	This test is the responsibility of Systest Labs. However, it begins with the Temperature/ Power Variation test which lasts 48 hours.
Electrical Tests			
<input checked="" type="checkbox"/>	Power Disturbance	V2 4.8	
<input checked="" type="checkbox"/>	Electromagnetic Radiation	V2 4.8	
<input checked="" type="checkbox"/>	Electrostatic Disruption	V2 4.8	
<input checked="" type="checkbox"/>	Electromagnetic Susceptibility	V2 4.8	
<input checked="" type="checkbox"/>	Electrical Fast Transient	V2 4.8	
<input checked="" type="checkbox"/>	Lightning Surge	V2 4.8	
<input checked="" type="checkbox"/>	Conducted RF Immunity	V2 4.8	
<input checked="" type="checkbox"/>	Magnetic Fields Immunity	V2 4.8	

4.0 Testing Phase

Prior to the commencement of testing, the Exit Criteria referenced above shall be met and all involved parties shall have agreed on a schedule.

4.1 Hardware Requirements

Refer to Section 4 Volume 1 of the VVSG. This section contains the requirements for the machines and manufactured devices that are part of a voting system. It specifies minimum values for certain performance characteristics, physical characteristics; and design, construction, and maintenance characteristics for the hardware and selected related components of all voting systems. These requirements are reflected in the following test procedures.

4.2 Test Procedures

4.2.1 Non-Operating Tests

4.2.1.1 Maintainability (VVSG II 4.7.2)

Maintainability represents the ease with which maintenance actions can be performed based on the design characteristics of equipment and software and the processes the vendor and election officials have in place for preventing failures and for reacting to failures. Maintainability includes the ability of equipment and software to self-diagnose problems and make non-technical election workers aware of a problem. Maintainability addresses all scheduled and unscheduled events, which are performed to:

- Determine the operational status of the system or a component;
- Adjust, align, tune, or service components;
- Repair or replace a component having a specified operating life or replacement interval;
- Repair or replace a component that exhibits an undesirable predetermined physical condition or performance degradation;
- Repair or replace a component that has failed; and
- Verify the restoration of a component, or the system, to operational status.

Maintainability shall be determined based on the presence of specific physical attributes that aid system maintenance activities, and the ease with which system maintenance tasks can be performed by the ITA. Although a more quantitative basis for assessing maintainability, such as the mean to repair the system is desirable, the qualification of a system is conducted before it is approved for sale and thus before a broader base of maintenance experience can be obtained.

Should significant impediments or difficulties be encountered that are not remedied by the vendor, Percept will include such findings in the qualification test results of the qualification test report.

4.2.1.2 Safety (VVSG I 4.3.8)

All voting systems shall meet the following requirements for safety:

- a. All voting systems and their components shall be designed to eliminate hazards to personnel or to the equipment itself.
- b. Defects in design and construction that can result in personal injury or equipment damage must be detected and corrected before voting systems and components are placed into service.

c. Equipment design for personnel safety shall be equal to or better than the appropriate requirements of the Occupational Safety and Health Act, Code of Federal Regulations, Title 29, Part 1910.

4.2.1.3 Transit Drop

This test is equivalent to the Transit Drop Test for equipment weighing between 100 and 1000 pounds (corner drop), MIL STD 810D, Method 516.3, Procedure IV, except that the drop height specified in Table 516.3-II therein is reduced to 12 inches. Drops shall be made from a quick-release hook or drop tester.

4.2.2 Non-Operating Environmental Tests

4.2.2.1 Bench Handling Test (VVSG II 4.6.2)

The bench-handling test simulates stresses faced during maintenance and repair of voting machines and ballot counters.

4.2.2.1.1 Applicability

All systems and components, regardless of type, shall meet the requirements of this test. This test is equivalent to the procedure of MIL-STD-810D, Method 516.3, Procedure VI.

4.2.2.2 Vibration Test (VVSG II 4.6.3)

The vibration test simulates stresses faced during transport of voting machines and ballot counters between storage locations and polling places.

4.2.2.2.1 Applicability

All systems and components, regardless of type, shall meet the requirements of this test. This test is equivalent to the procedure of MIL-STD-810D, Method 514.3, Category 1- Basic Transportation, Common Carrier.

4.2.2.3 Low Temperature Test (VVSG II 4.6.4)

The low temperature test simulates stresses faced during storage of voting machines and ballot counters.

4.2.2.3.1 Applicability

All systems and components, regardless of type, shall meet the requirements of this test. This test is equivalent to the procedure of MIL-STD-810D, Method 502.2, Procedure I-Storage. The minimum temperature shall be -4 degrees F.

4.2.2.4 High Temperature Test (VVSG II 4.6.5)

The high temperature test simulates stresses faced during storage of voting machines and ballot counters.

4.2.2.4.1 Applicability

All systems and components, regardless of type, shall meet the requirements of this test. This test is equivalent to the procedure of MIL-STD-810D, Method 501.2, Procedure I-Storage. The maximum temperature shall be 140 degrees F.

4.2.2.5 Humidity Test (VVSG II 4.6.6)

The humidity test simulates stresses faced during storage of voting machines and ballot counters.

4.2.2.5.1 Applicability

All systems and components regardless of type shall meet the requirements of this test. This test is similar to the procedure of MIL-STD-810D, Method 507.2, Procedure I-Natural Hot-Humid. It is intended to evaluate the ability of the equipment to survive exposure to an uncontrolled temperature and humidity environment during storage. This test lasts for ten days.

4.2.3 Operating Environmental Test

4.2.3.1 Accessibility and Human Engineering Evaluation

Refer to MIL-STD-1472 Human Engineering Design Criteria for Military Systems, Equipment and Facilities.

4.2.3.2 Temperature and Power Variation Tests (VVSG II 4.7.1)

This test is similar to the low temperature and high temperature tests of MIL-STD810D, Method 502.2 and Method 501.2, with test conditions that correspond to the requirements of the performance standards. This procedure tests system operation under various environmental conditions for at least 163 hours. During 48 hours of this operating time, the device shall be in a test chamber. For the remaining hours, the equipment shall be operated at room temperature. The system shall be powered for the entire period of this test; the power may be disconnected only if necessary for removal of the system from the test chamber.

Operation shall consist of ballot-counting cycles, which vary with system type. An output report need not be generated after each counting cycle; the interval between reports, however, should be no more than 4 hours to keep to a practical minimum the time between the occurrence of a failure or data error and its detection.

Test Ballots per Counting Cycle

Precinct count systems 100 ballots/hour

Central count systems 300 ballots/hour

The recommended pattern of votes is one chosen to facilitate visual recognition of the reported totals; this pattern shall exercise all possible voting locations. System features such as data quality tests, error logging, and audit reports shall be enabled during the test.

4.2.3.3 Reliability (VVSG II 4.7.3)

The MBTF shall be measured during the conduct of other system performance tests specified in this section, and shall be at least 163 hours.

4.2.3.4 Data Accuracy (VVSG II 4.7.1.1)

This test is run in conjunction with Temperature and Power Variation Tests (VVSG II 4.7.1). Refer to the VVSG for details.

4.2.4 Electrical Tests

4.2.4.1 Power Disturbance (VVSG II 4.8)

The test for power disturbance disruption shall be conducted in compliance with the test specified in IEC 61000-4-11 (1994-06).

Vote scanning and counting equipment for paper-based systems, and all DRE equipment, shall be able to withstand, without disruption of normal operation or loss of data:

- a. Surges of 30% dip @10 ms;

- b. Surges of 60% dip @100 ms & 1 sec
- c. Surges of >95% interrupt @5 sec;
- d. Surges of $\pm 15\%$ line variations of nominal line voltage; and
- e. Electric power increases of 7.5% and reductions of 12.5% of nominal specified power supply for a period of up to four hours at each power level.

4.2.4.2 Electromagnetic Radiation (VVSG II 4.8)

Vote scanning and counting equipment for paper-based systems, and all DRE equipment, shall comply with the Rules and Regulations of the Federal Communications Commission, Part 15, Class B requirements for both radiated and conducted emissions.

4.2.4.3 Electrostatic Disruption (VVSG II 4.8)

The test for electrostatic disruption shall be conducted in compliance with the test specified in IEC 61000-4-2 (1995-01).

Vote scanning and counting equipment for paper-based systems, and all DRE equipment, shall be able to withstand ± 15 kV air discharge and ± 8 kV contact discharge without damage or loss of data. The equipment may reset or have momentary interruption so long as normal operation is resumed without human intervention or loss of data. Loss of data means votes that have been completed and confirmed to the voter.

4.2.4.4 Electromagnetic Susceptibility (VVSG II 4.8)

The test for electromagnetic susceptibility shall be conducted in compliance with the test specified in IEC 61000-4-3 (1996).

Vote scanning and counting equipment for paper-based systems, and all DRE equipment, shall be able to withstand, without disruption of normal operation or loss of data, conducted RF energy of:

- a. 10V AC & DC power; and
- b. 10V, 20 sig/control >3m.

4.2.4.5 Electrical Fast Transient (VVSG II 4.8)

The test for electrical fast transient protection shall be conducted in compliance with the test specified in IEC 61000-4-4 (1995-01).

Vote scanning and counting equipment for paper-based systems, and all DRE equipment, shall be able to withstand, without disruption of normal operation or loss of data, electrical fast transients of:

- c. 2 kV AC & DC external power lines;
- d. ± 1 kV all external wires >3m no control; and
- e. ± 2 kV all external wires control.

4.2.4.6 Lightning Surge (VVSG II 4.8)

The test for lightning surge protection shall be conducted in compliance with the test specified in IEC 61000-4-5 (1995-02).

Vote scanning and counting equipment for paper-based systems, and all DRE equipment, shall be able to withstand, without disruption of normal operation or loss of data, surges of:

- a. ± 2 kV AC line to line;

- b. ± 2 kV AC line to earth;
- c. $\pm .5$ kV DC line to line >10m;
- d. $\pm .5$ kV DC line to earth >10m; and
- e. ± 1 kV I/O sig/control >30m.

4.2.4.7 Conducted RF Immunity (VSG II 4.8)

The test for conducted RF immunity shall be conducted in compliance with the test specified in IEC 61000-4-6 (1996-04).

Vote scanning and counting equipment for paper-based systems, and all DRE equipment, shall be able to withstand, without disruption of normal operation or loss of data, conducted RF energy of:

- a. 10V AC & DC power; and
- b. 10V, 20 sig/control >3m.

4.2.4.8 Magnetic Fields Immunity (VSG II 4.8)

The test for AC magnetic fields RF immunity shall be conducted in compliance with the test specified in IEC 61000-4-8 (1993-06).

Vote scanning and counting equipment for paper-based systems, and all DRE equipment, shall be able to withstand, without disruption of normal operation or loss of data, AC magnetic fields of 30 A/m at 60 H